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BOOK REVIEWS

Mikloško, J.—Vajteršic, M.—Vrťo, I.—Klette, R.:
FAST ALGORITHMS AND THEIR IMPLEMENTATION ON SPECIALIZED PARALLEL COMPUTERS. Veda, Bratislava-North-Holland, Amsterdam/New York/Oxford/Tokyo 1989, 264 pages.

The monograph is published as Volume 5 in the series "Special Topics in Supercomputing" edited by G. Rodrigue et. al. The authors deal with problems of creating fast numerical and non-numerical algorithms on specialized parallel computers. The book is devoted to six topics in six chapters, namely:

Chapter 1. Fast parallel algorithms,

Chapter 2. Fast parallel algorithms for associative computers,

Chapter 3. Systolic algorithms and their implementation on specialized processors,

Chapter 4. Algorithms for pipeline processors, matrix processors and multiprocessors,

Chapter 5. Fast algorithms for solution of a system of linear algebraic equations on specialized VSLI computers,

Chapter 6. Lower time bounds for SIMD-type algorithms.

The first chapter describes the methods and the general principles of forming fast parallel algorithms on various examples and also illustrates the application of actual algorithms for computation of two significant problems, matrix multiplication and solution of Dirichlet's problem for the Poisson equation on a square. Throughout the chapter attention is paid to algorithms that are not naturally parallel.

The second chapter is focused on parallel data processing algorithms and its aim is to demonstrate the particularities of associative information processing. For a parallel associative computer of the SIMD-type there are formulated several sorting algorithms, algorithms of the Fast Fourier Transform and some basic tasks of linear algebra.

The problem of systolic algorithms, i.e. algorithms that can be implemented on systolic arrays, is tackled in the third chapter. A successful design of systolic arrays depends on the cooperation of mathematicians and designers of integrated circuits. However, this chapter is only devoted to problems of algorithmic level. Some basic principles of the theory of complexity of systolic algorithms are also explained.

Besides the types of parallel computers investigated in the previous two chapters, the fourth chapter is devoted to various other parallel architectures enabling the fast data processing, namely pipeline processors, matrix processors and multiprocessors. Along with the corresponding algorithms, the structure of architecture of a pipeline processor CRAY–1, of a matrix processor DAP and a multiprocessor EGPA are described.

The aim of the fifth chapter is to suggest some specialized VSLI computers that could be used to solve dense systems of linear algebraic equations. After analysing several types of elimination algorithms, the Gauss-Jordan, Rutishauser elimination is chosen. With a detailed knowledge of this algorithm there are analysed four specialized VSLI computers, namely the single chip computer, the P-processor computer with the on-chip cache memory and the of-chip active memory, the orthogonal pipeline vector processor and the systolic array.

The specialized computers demonstrated in the previous chapters have restrictions that may be characterized by lower time bounds. To demonstrate this idea a general method called "the data transfer for obtaining lower time bounds" is described in the sixth chapter. This method is illustrated applying a variety of different parallel processing architectures. Computational problems are not treated.

At the end of each chapter there is a list of references. By stressing the implementation view-point of the algorithms described, the book is addressed to the many readers who use computer to solve their problems. The comprehensive survey of the ever growing number of new results in the field of this active research will be most useful for them. The problem of technical equipment of parallel computers are tuckled only at the level necessary to understand the design and implementation of the corresponding algorithms.

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